

**REMARKS**

The Office Action issued January 22, 2002 has been reviewed and the comments of the U.S. Patent and Trademark Office have been considered. Claims 1-104 are pending in this application, and are submitted for reconsideration by the Examiner.

Applicant thanks the Examiner for indicating that claims 2-20 and 36-104 have been allowed.

The disclosure stands objected to because of certain informalities identified by the Examiner. The specification has been amended in according with the Examiner's comments. No new matter has been added. Accordingly, applicant submits that the objection to the disclosed has been overcome and should be withdrawn.

Claims 1 and 21-35 stand rejected 35 U.S.C. §112, 1<sup>st</sup> paragraph, as containing subject matter which was allegedly not described in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. In particular, the Office Action concludes that claims 1 and 21-35 fail to recite a "deflector having two reentrant slots," and that the applicant has not described a deflector with reentrant slots that will function in the manner as claimed. In support of this conclusion, the Office Action relies on upon the decision in *The Gentry Gallery Inc. v. The Berkline Corp.*, 45 U.S.P.Q.2d 1498, 1503 (Fed. Cir. 1998). The alleged basis for this rejection is that pending claims 1 and 21-35 fail to recite essential or critical structure. Applicant respectfully disagrees with the conclusion of the Office Action, and asserts that the requirements of 35 U.S.C. §112, 1<sup>st</sup> paragraph, have been met, and that the rejection should be withdrawn.

Claims 1 and 21-35 also stand rejected under 35 U.S.C. §112, 2<sup>nd</sup> paragraph, as being indefinite. Applicant respectfully disagrees that the recitation of a K-factor of a sprinkler and the associated function of these claimed components renders the claims indefinite. The K-factor is a

discharge coefficient that identifies an operative requirement for the structural features of a sprinkler. Specifying a K-factor for a sprinkler particular points out and distinctly claims a particular sprinkler, and the claims are thus definite. Furthermore, recitation of a minimum operating flow pressure for the claimed sprinkler provides a functional association between the claimed sprinkler components, and precisely defines structural attributes of the interrelated components of the claimed invention. Moreover, recitation of NFPA, commodity storage height, and particular ceiling heights further points out the distinct early suppression sprinkler that is recited in the claims and defined by the preamble of the claims. Accordingly, applicant submits that the claims are definite, and the rejection under 35 U.S.C. §112, 2<sup>nd</sup> paragraph, should be withdrawn.

Applicant additionally traverses these rejections, and respectfully asserts that the requirements of 35 U.S.C. §112, 1<sup>st</sup> and 2<sup>nd</sup> paragraph, have been met because (1) the originally filed claims are supported by an actual reduction to practice; (2) the originally filed specification provides a clear depiction of the invention in detailed drawings and description to permit one skilled in the art to clearly recognize that the inventors had possession of the claimed invention, and the claimed invention functioned in the manner as claimed; (3) each of the pending claims recites a generic claim for a representative number of species described in the specification; and (4) each of the pending claims recites the claimed invention as a whole in compliance with the originally filed specification, and recites the functional requirements of the claimed associated structure. *See, MPEP §2163.*

First, applicant asserts that the originally filed claims demonstrate that he possessed the claimed invention. The originally filed claims recite an early suppression fast response sprinkler with a particular K-factor and a minimum flowing pressure. For example, originally filed claim 1 recites an early suppression fast response sprinkler with a K-factor of about 25 and a flowing pressure of about 15 pounds per square inch. This claim is based on a successful testing of at least one of the preferred embodiments and is clearly described in the specification. In particular, the originally filed specification at, for example, page 20, line 5, to page 25, line 11,

describes the testing parameters and the results obtained for the claimed sprinkler. Based on the description of these results, a person skilled in the art would recognize that the inventor had possession of the invention recited in the claimed invention as a whole.

The pending claims 1 and 21-35 recite additional features, such as the sprinkler body, that were not recited in the originally filed claims. Each of these additional features is supported by the originally filed specification, and conveys to one skilled in the art that the inventor possessed the invention as is now claimed. In particular, the invention, as recited in pending claims 1 and 21-35, is supported at least by the testing results set forth in the originally filed specification. Thus, the originally filed claims and the specification demonstrate that the inventor possessed the invention.

Second, the originally filed specification provides a clear depiction of the invention in detailed drawings and description to permit one skilled in the art to clearly recognize that the inventors had possession of the claimed invention, and the claimed invention functions in the manner as claimed. Each of the drawings, which constitute part of the originally filed specification, clearly depicts preferred embodiments of the claimed invention, and demonstrates that the inventor possessed the claimed invention. For example, Figs. 5 and 5A illustrate a preferred configuration for a deflector with the reentrant slots, which provides a functioning embodiment of the claimed early suppression fast response sprinkler, as shown by the pan collection data illustrated in Figs. 9 and 10. The functionality of the illustrated embodiment of the sprinkler is further confirmed by the description of the operative and testing parameters set forth in specification. Thus, the detailed drawings of the preferred embodiment and the accompanying description in the specification regarding the operative performance of the sprinkler conveys that the inventor possessed the claimed invention, and that the claimed invention worked for its intended function.

Third, each of the pending claims recites a generic claim for a representative number of species described in the specification. Applicant describes a number of low pressure early

suppression fast response (ESFR) sprinklers that provide “a relatively greater quantity of fire retardant fluid... diverted to produce ... the spray pattern at lower pressures, as compared to ... thrust generated by prior art deflectors...” (page 16, line 4). The specification further describes, at page 16, line 4, for example, that sprinkler of the preferred embodiments produces a spray pattern “... at relatively lower inlet pressures, than provided by prior art sprinklers of similar purpose...” and at page 23, line 2, further describes that these sprinklers are “...designed to operate at substantially lower end head pressures, as compared to ESFR sprinklers having a nominal K-factor of 14.” The specification states, at page 25, line 14, that the outlet of “[t]he sprinkler 10 may have a K-factor in the range of about 8.0 to 50.0, preferably in the range from about 14.0 to 30.0, more preferably in the range of about 22.0 to about 28.0, and most preferably the K-factor is about 25.0.” The originally filed specification provides, for example, a variety of deflectors and reentrant slot orientations for the claimed low pressure early suppression fast response sprinkler. Figs. 3 and 5 illustrate two of these different deflectors 21, 30 that may contain a grouping of equally spaced reentrant slots 29 (Fig. 3), or possibly a first and second grouping of reentrant slots 54, 60 (Fig. 5). The specification at, for example, page 25, line 18 to page 26, line 13, describes a variety of arrangement for the deflectors and, thus, the sprinklers of the preferred embodiments. Because the outlet of the ESFR sprinkler is described as having a range of K-factors, and that various deflectors may be included in the low-pressure ESFR sprinklers, each of the pending claims recites a generic claim for a representative number of species described in the specification, and the particulars of the deflector which may be used with each of these species are nonessential to the generic recitation of the claimed invention as a whole.

Fourth, each of the pending generic claims recites the claimed invention as a whole in compliance with the originally filed specification. That is, the pending claims recite the invention without omission of an essential element. As discussed above, the originally filed specification provides sufficient description of a representative number of species of the preferred embodiment. While describing a number of low pressure ESFR sprinkler embodiments, applicant has not given testimony nor admitted to limiting the ESFR sprinklers of

his invention to the particular configuration of the deflectors or, more particularly, to the requirement for two reentrant slots on these deflectors. Also, applicant has not stated that these deflector and reentrant slot variations are outside the stated purpose of the invention.

Contrary to the conclusion of the Office Action, applicant has not recited claims broader than the supporting disclosure, and has not indicated that the disclosure is so limiting. On the other hand, applicant has provided a written description that provides a person skilled in the art with sufficient basis to convey that he had possession of various species of the invention, and that a deflector with two reentrant slots is not the only possible configuration of the deflectors, but rather as being among a number of variations that may be included in the low pressure ESFR sprinklers. These various embodiments described in the specification convey to one of skill in the art that a deflector with at least two reentrant slots is not an essential or critical feature for the claimed invention as a whole. Therefore, pending claims 1 and 12-35 are commensurate with this scope of the invention, and are supported by the originally filed specification.

Moreover, one skilled in the art would recognize that the pending claims comply with the written description requirement because they recite a particular sprinkler and associated structure, and the functional requirements of the associated structure. Pending claim 1, for example, recites, *inter alia*, an early suppression fast response sprinkler with a sprinkler body defining an orifice and outlet, and a K-factor of about 25 or more; claim 1 further recites a minimum design flowing pressure of the sprinkler of about 15 pounds per square inch at the most hydraulically remote sprinkler. Furthermore, each of the pending claims recites a sprinkler with a sprinkler body and a minimum flowing pressure at the most hydraulically remote sprinkler so that the claimed sprinkler provides an early suppression fast response sprinkler for a specified storage and ceiling height. These minimum operating pressures in combination with the features of the sprinkler body, for example K-factor, precisely define structural attributes of the interrelated components of the claimed invention, and distinctly define the boundaries of patent protection sought. *See*, MPEP §2173.05 (g). Thus, applicant asserts that pending claims 1 and 21-35 are claims which recite the invention as originally possessed by the inventor, and are not

required to recite additional features, which one skilled in the art would recognize as being as nonessential to the claimed low pressure ESFR sprinklers. Thus, these nonessential deflectors and reentrant slots are not required to be included in the claims, and the pending claims are definite, in addition to complying with the scope provided by the originally filed specification. And these claims, as now pending, define applicant's invention, which is patentable.

For all of the reasons set forth above, applicant submits that claims 1 and 21-35, as well as claims 2-20 and 36-104 are in condition for allowance.

**CONCLUSION**

In view of the foregoing amendments and remarks, applicant respectfully requests the reconsideration and reexamination of this application and allowance of the pending claims. Applicant respectfully invites the Examiner to contact the undersigned at 609.919.6644 if there are any outstanding issues that can be resolved via a telephone conference.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

**EXCEPT** for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire period this application is pending, including fees due under 37 C.F.R. §§1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. §1.136(a)(3).

Respectfully submitted,

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE SPECIFICATION:**

Paragraph beginning at page 8, line 17, has been amended as follows:

--Preferred embodiments of the invention may have one or more of the following additional features. The sprinkler further comprises a sprinkler body defining an orifice and an outlet for delivering a flow of fluid from a source, and a deflector mounted with a first surface opposed to flow of fluid from the outlet, the deflector defining at least two reentrant slots disposed in opposition about a deflector axis, the reentrant slots extending from the first surface through the deflector, and the reentrant slots extending from slot openings at an outer peripheral edge of the deflector inwardly from the peripheral edge toward the deflector axis. Preferably, the reentrant slots extend inwardly along reentrant slot centerlines, and each of the reentrant slots has a first width transverse to its reentrant slot centerline in a region of the peripheral edge and a second slot width transverse to its reentrant slot centerline in a region spaced inwardly, toward the deflector axis, relative to the region of the peripheral edge, the second width being greater than the first width. More preferably, the sprinkler further comprises an apex element, the deflector is mounted to the apex element, and an innermost portion of each of the reentrant slots extends inwardly toward the deflector axis to be no further outward from the deflector axis [that] than an outermost surface of the apex element, and, preferably, the innermost portions of the reentrant slots extend inwardly toward the deflector axis to underlie the apex element, relative to fluid flow direction from the outlet. The reentrant slot centerlines extend radially outward from the deflector axis. The sprinkler is suited for installation up to 18 inches below a ceiling. The deflector has a thickness measured from the first surface in the direction of fluid flow equal to or greater than about 0.06 inch. The reentrant slots comprise a plurality of reentrant slots comprising at least a first type of reentrant slot and a second type of reentrant slot, reentrant slots of the first type extending from the first surface through the deflector with the slot openings at an outer peripheral edge of the deflector body, each of the reentrant slots of the first type extending inwardly from the peripheral edge, along the reentrant slot centerlines, generally toward the deflector axis, to a first type length, reentrant slots of the second type extending through the

deflector from the first surface, with the slot openings at the peripheral edge of the deflector body, each of the reentrant slots of the second type extending inwardly from the peripheral edge, along the reentrant slot centerlines, generally toward the deflector axis, to a second type length, and the innermost portions of the reentrant slots of the first type extending inwardly toward the deflector axis to be no further outward from the deflector axis than the outermost surface of the apex element. Preferably, each of the reentrant slots of the first type has a first width transverse to its slot centerline in a region of the peripheral edge and a second width transverse to its slot centerline in a region spaced inwardly, toward the deflector axis, relative to the region of the peripheral edge, the second width of the first type slots being greater than the first width of the first type slots, and each of the reentrant slots of the second type has a first width transverse to the slot centerline in a region of the peripheral edge and a second width transverse to the slot centerline in a region spaced inwardly, toward the deflector axis, relative to the region of the peripheral edge, the second width of the second type slots being greater than the first width of the second type slots. The first type length is equal to or greater than the second type length. The reentrant slot centerlines of the reentrant slots of the first type extend substantially radially outward from the deflector axis. The reentrant slot centerlines of the reentrant slots of the second type extend substantially radially outward from the deflector axis. The reentrant slots of the first type comprise at least two pairs of generally opposing reentrant slots. The reentrant slots of the second type comprise at least two pairs of generally opposing reentrant slots. The first type length of the reentrant slots of the first type is substantially the same. The second type length of the reentrant slots of the second type is substantially the same. The reentrant slots of the first type define reentrant portions having an elongated shape. The reentrant slots of the second type define reentrant portions having a pear-shape. A reentrant slot of the second type is located between reentrant slots of the first type. --

Paragraph beginning at page 15, line 3, has been amended as follows:

--Referring to Fig. 3, a deflector 21 of the invention for use in pendent-type fire protection sprinkler 10 has an outside diameter,  $D_1$ , e.g., a uniform value of about 1.75 inches. The deflector [30] 21 has a thickness of about 0.09 inch, and it is fabricated from a phosphor bronze alloy UNS52100, per ASTM B103, with a Rockwell B Scale hardness of about 92. The

diameter of deflector 21 is optimized to provide, from a predetermined height, a particular spray pattern over a desired area to be protected from fire. The outside diameter is limited by the volume of fire retardant fluid, and by the size of the orifice. Moreover, where cost is a consideration, increasing the size of the deflector diameter requires the thickness of deflector 21 to be increased in order to ensure that it has sufficient rigidity to withstand the force of the discharged stream of fluid. --

Paragraph beginning at page 16, line 13, has been amended as follows:

--Referring to Fig. 4, a spray pattern for a commercial ESFR fire protection sprinkler with the deflector 21 having reentrant slots [27] 29 is illustrated. The reentrant slots [27] 29 result in a spray pattern 2 in which the spray direction is altered towards a center main axis 3 of a sprinkler 4. In particular, the reentrant slots [27] 29 of the deflector result in formation of a central core 6 of spray pattern 2, with tines of the deflector resulting in formation of an outer shell 8 of spray pattern 2. In particular, the central core portion 6 of the spray pattern 2 has fluid droplets with greater momentum (i.e. mass times velocity), at relatively lower inlet pressures, than provided by prior art sprinklers of similar purpose. --

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